

expansion of the functional insert is constrained by the surrounding body when the temperature of the microelectronic package increases.

Page 5, line 7, after "throughout." insert the following new paragraph:

a2
L -- The resulting functionally-graded metal substrate finds particular use in housing microelectronic components. A heat-generating component, such as, for example a chip, can be attached directly to the functional insert. The functional insert which can have a thermal conductivity up to about 400 W/mK, is preferably greater than the thermal conductivity of the surrounding body. The surrounding body preferably has a CTE that is lower than the CTE of the functional insert, and thus the surrounding body controls or constrains the expansion of the functional insert along its contact surfaces as the functional insert conducts heat away from the heat-generating component.

Page 5, line 15, after "composition." insert the following new paragraph:

a3
L -- Alternative embodiments of the invention also include sintering a solid metal surrounding body having a cavity therein containing a functional insert powder composition to form a functionally-graded metal substrate, or diffusion bonding or brazing a solid metal functional insert to a solid metal surrounding body. Infiltration can follow sintering in embodiments which include sintering the surrounding body containing a functional insert powder composition or a compact of insert powder composition.

Page 7, line 32 delete "functional core" and insert --surrounding body--.

Page 8, line 11, after "fiber." please insert the following new paragraph:

a4
L -- When the functionally-graded substrate having two different metal compositions is used in microelectronic applications, a heat-generating component, for example, a chip, is attached directly to the functional insert and the functional insert is surrounded by the surrounding body. The functional insert preferably has a thermal conductivity that is greater than the thermal conductivity of the surrounding body, and the surrounding body preferably has a CTE that is

a4 cont.
lower than the CTE of the functional insert. The surrounding body thus controls or constrains the expansion of a functional insert along its bonded surfaces as the functional insert conducts heat away from the heat-generating component.

Page 10, line 9, after "conductivity" insert --relative to the surrounding body--.

Page 10, line 12, after "and" delete "molyvdenum" and insert -- molybdenum --.

Page 10, line 18, after "and" delete "molyvdenum" and insert -- molybdenum --.

a5
Page 10, line 28, after "conductivity" insert --relative to the surrounding body--.

Page 12, line 15, after "about 5.6" delete "ppm/C" and insert -- ppm/°C --.

Page 12, line 16, delete "ppm/C." and insert -- ppm/°C where the CTE is measured at

a6
ambient temperature.

Page 19, line 6, delete "270-280C" and insert -- 270-280°C --.

Page 19, line 29, delete "+20C" and insert -- +20°C --.

IN THE CLAIMS:

a7
1. (Amended) A functionally-graded metal substrate comprising:

a functional insert;

a surrounding body that surrounds the functional insert;

wherein the functional insert and the surrounding body are two different metal compositions in the x-y plane of the substrate; and,

wherein the functional insert has a higher thermal conductivity than the surrounding body and the surrounding body has a lower coefficient of thermal expansion than the functional insert.

[wherein the surrounding body surrounds the functional insert.]

Claim 6, line 34, delete "and" and insert --,-- and on page 23, line 7 after "fiber" insert --

and combinations thereof--